

**IN THE UNITED STATES PATENT
AND TRADEMARK OFFICE**

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SHOWER TEMPERATURE DISPLAY

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1 **I. TITLE: SHOWER TEMPERATURE DISPLAY**

2
3 **II. BACKGROUND OF THE INVENTION**

4
5 **1. Field of the Invention.**

6
7 The present invention relates to temperature display systems, and
8 more particularly, to a device used to display real-time temperature of
9 water delivered by a showerhead.

10
11 **2. Description of the Related Art.**

12
13 Several designs for water temperature display systems have been
14 designed in the past. None of them, however, includes a real-time
15 temperature display that is installed directly to an existing shower arm and
16 showerhead, without modification of any in-wall plumbing system. In
17 addition, none of them include an adjustable LCD display panel to provide
18 optimal viewing angles.

19
20 Typical shower temperature control systems consist of cumbersome
21 and expensive adaptations that require replacement of existing plumbing
22 systems, including installation of electrical wiring. These modifications are
23 very expensive and time consuming; furthermore, most consumers are not
24 eager to dismantle their bathroom walls or wall tiles for devices that
25 practically have no market presence or time-tested reliability. If the typical
26 shower temperature control system were to fail, the user would have a
27 second expense of having to rebuild the plumbing system back to its
28 originality. Other shower temperature control systems require retrofitting

1 devices that control a mixing chamber and mount on an outside wall, but
2 only when the hot and cold water have a dependent valve control. These
3 devices would not work on typical shower systems that have independent
4 hot and cold controls prior to a mixing chamber.

5
6 In addition, other systems fail by displaying water temperature that
7 is nonexistent. When water flow is not present, typical temperature
8 sensors continue to read the internal and external temperatures of the
9 mixing chamber, coupling, and pipes caused by heating retention of the
10 materials. This thermo affect causes these type of systems to display a
11 temperature, even when water is not present or being discharging through
12 the showerhead.

13
14 Applicant believes that the closest reference corresponds to U.S.
15 Patent No. 5,944,255 issued to Shirmohamadi for Shower water automatic
16 temperature controller on August 31, 1999. However, it differs from the
17 present invention because Shirmohamadi teaches a self-contained unit 160
18 that rapidly and accurately senses, controls and maintains the temperature
19 of water delivered to the user of a shower or bath. The invention allows a
20 user to preset a desired water temperature using a manual control interface
21 60 and uses a sensor 10 located on (or within) the mixer outlet pipe 20 to
22 measure the temperature of the mixed water being delivered to the user.
23 The sensor produces an input signal that is used by a microprocessor 30 to
24 calculate both derivative gain and proportional gain, and fuzzy logic may
25 also be used by the microprocessor to produce an output signal, such that
26 the system responds quickly and accurately to both quantum temperature
27 changes and to the rate of temperature change. The output signal controls
28 a motor 80 that via the action of gears 90, controls the action of the water

1 mixer valve 110 thus maintaining a constant temperature of water
2 delivered to the user. The invention also allows a number of users to preset
3 temperatures for their own comfort, and to select this preset temperature
4 before entering the shower, so negating the need for manual "trial and
5 error" adjustment. Importantly, the invention is also designed so that any
6 layperson, with no plumbing experience and the minimum of mechanical
7 ability may retrofit the device to an existing water delivery system.

8
9 Other patents describing the closest subject matter provide for a
10 number of more or less complicated features that fail to solve the problem
11 in an efficient and economical way. None of these patents suggest the
12 novel features of the present invention. There are no similar water
13 temperature display systems to the best of applicant's knowledge, having a
14 real-time temperature display that is installed directly to an existing
15 shower arm and showerhead, without modification of any in-wall
16 plumbing system and has an adjustable LCD display panel to provide
17 optimal viewing angles.

18 19 **III. SUMMARY OF THE INVENTION**

20
21 The present invention departs from the conventional concepts of
22 shower control systems, and in so doing, provides a device that is less
23 costly and simplifies installation while providing the ideal shower
24 temperature device. This present invention provides users with precise
25 manual control of shower temperatures by displaying temperature in real
26 time. Thus, a user can manually adjust the water temperature to a desired
27 setting by viewing the temperature display panel, while making the
28 necessary hot and cold water adjustments without the fear that the battery

1 will fail and the water will shut off in midst of their shower. The present
2 invention employs a unique system that senses when water is not
3 discharging through the showerhead. Circuitry detects the absence of
4 water in a coupling assembly and displays a non-temperature reading in
5 response.

6
7 More specifically, the instant invention is an electronic shower
8 temperature display for shower assemblies including a showerhead,
9 comprising temperature-sensing means having a first input connected to a
10 shower arm of the shower assemblies and a first output generating a
11 voltage signal as a function of temperature sensed by the first input.
12 Computerized means have a second input connected to the first output for
13 processing the signal to generate a second output signal and display means
14 connect to the second output signal.

15
16 Yet more specific, the instant invention is an electronic shower
17 temperature display device which can be easily retrofitted onto an existing
18 shower arm and showerhead assembly of a shower system for a water
19 delivery system that consist of either a dependent or independent hot and
20 cold controls prior to a mixing chamber, comprising a sensor-coupling unit
21 housing a temperature sensor, a panel support bracket, and a temperature
22 display adjustable display panel assembly. The adjustable display panel
23 assembly has a microprocessor-based circuitry with means to display real-
24 time water temperature. The microprocessor-based circuitry
25 communicates with the temperature sensor by means of a conducting
26 cable. The microprocessor-based circuitry is housed within the adjustable
27 display panel assembly. The adjustable display panel assembly further
28 comprises a battery power source communicating with and supplying

1 power to the microprocessor-based circuitry. The adjustable display panel
2 assembly further comprises a manual control interface communicating
3 with the microprocessor-based circuitry. The microprocessor-based
4 circuitry monitors both water temperature and the presence or absence of
5 water through the shower arm and the showerhead assembly.

6
7 The adjustable display panel assembly further comprises a
8 conductivity sensor. The microprocessor-based circuitry monitor signals
9 from the temperature sensor and the conductivity sensor in order to detect
10 the actual water temperature as it flows through the shower arm and the
11 showerhead assembly. The microprocessor-based circuitry has a
12 programmable memory storage system used for retrieving multi-user
13 temperature settings. The manual control interface is selected from a
14 group consisting of a plurality of buttons, a rotatable knob, or a linear slide
15 control, which may be used to program the desired multi-user temperature
16 settings. The plurality of buttons correspond to the multi-user temperature
17 settings. The adjustable display panel assembly comprises audible alarm
18 means. The microprocessor-based circuitry further comprises a
19 programmable predetermined temperature warning set within the
20 programmable memory storage system. The audible alarm means engage
21 when the predetermined temperature is surpassed to provide protection
22 from scorching. The temperature sensor is selected from the group
23 consisting of a thermocouple, a thermistor, a Resistance Temperature
24 Detector (RTD), an integrated circuit temperature sensor, or a temperature-
25 to-fluid pressure transducer. The conducting cables are removable from
26 the display panel housing. The battery power source is an electric battery,
27 which may be an electric dry cell battery. The audible alarm means is
28 selected from the group consisting of an electromechanical buzzer, a piezo

1 transducer, or a speaker tone driver circuit.

2
3 The sensor-coupling unit is generally cylindrical having first and
4 second ends, the first end having female threading and the second end
5 having male threading. The first end removably secured to the shower arm
6 and the showerhead removable secured to the second end. The panel
7 support bracket comprises a cylindrical ring, the sensor-coupling unit
8 snugly fitting within the cylindrical ring. The adjustable display panel
9 assembly connects to a flexible joint to allow the adjustable display panel to
10 swivel, slide, or shift position in order to provide an alternate viewing
11 angle.

12
13 It is therefore one of the main objects of the present invention to
14 provide a digital readout of water temperatures having the device directly
15 attached to an existing shower arm.

16
17 It is another object of the present invention to provide a digital
18 readout of water temperatures having the device directly attached to an
19 existing showerhead.

20
21 It is still another object of the present invention to provide a digital
22 readout of water temperatures having an adjustable panel support bracket.

23
24 It is yet another object of the present invention to provide a digital
25 readout of water temperatures having an adjustable display panel.

26
27 It is yet another object of the present invention to provide a digital
28 readout of water temperatures having its display panel be removable for

1 installation simplicity.

2

3 It is yet another object of the present invention to provide a digital
4 readout of water temperatures having its display panel be angular
5 adjustable in order to provide the optimal viewing angle.

6

7 It is yet another object of the present invention to provide a digital
8 readout of water temperatures having a connector be removable from the
9 display panel for installation simplicity.

10

11 It is yet another object of the present invention to provide a digital
12 readout of water temperatures and monitors both temperature and the
13 presence or absence of water through the device and the showerhead.

14

15 It is yet another object of the present invention to provide a digital
16 readout of water temperatures having a programmable retrievable memory
17 for multi-user temperature settings.

18

19 It is yet another object of the present invention to provide a digital
20 readout of water temperatures having a programmable scorch
21 temperature-warning setting.

22

23 It is yet another object of this invention to provide such a device that
24 is inexpensive to manufacture and maintain while retaining its
25 effectiveness.

26

1 Further objects of the invention will be brought out in the following
2 part of the specification, wherein detailed description is for the purpose of
3 fully disclosing the invention without placing limitations thereon.
4

5 IV. BRIEF DESCRIPTION OF THE DRAWINGS 6

7 With the above and other related objects in view, the invention
8 consists in the details of construction and combination of parts as will be
9 more fully understood from the following description, when read in
10 conjunction with the accompanying drawings in which:
11

12 **Figure 1** represents an isometric view of the present invention.
13

14 **Figure 2** shows an isometric view of the sensor-coupling unit.
15

16 **Figure 2a** shows a second isometric view of the sensor-coupling unit.
17

18 **Figure 3** shows an isometric view of the panel support bracket.
19

20 **Figure 4** shows an isometric view of the display panel assembly.
21

22 **Figure 5** is a schematic illustration of the temperature display circuit.
23

24 **Figure 6** is an isometric view of the present invention installed on a
25 shower assembly.
26
27
28

V. DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, where the present invention is generally referred to with numeral 10, it can be observed that it basically includes sensor-coupling unit 20, panel support bracket 40, and display panel assembly 60.

As shown in figure 1, panel support bracket 40 slides onto and is snugly secured onto sensor-coupling unit 20, which is removably attached to display panel assembly 60.

As seen in figures 2 and 2a, sensor-coupling unit 20 comprises male thread 32 outwardly extruding from face 30 and terminating at edge 34, and female thread 29 intrudes within sensor-coupling unit 20 a predetermined distance from edge 28. Approximately perpendicularly extending from face 30 is cylindrically shaped face 22 that extends to ridge 24. Cone 26 tapers slightly from ridge 24 and terminates at edge 28. Extending from face 22 is connecting cable 36, which terminates at connector 38. Connector 38 plugs into a port, not seen, opposite display panel 62 of display panel assembly 60.

As seen in figure 3, panel support bracket 40 comprises base 52. Approximately perpendicularly extending from base 52 is frame 50, which secures to tapered ring 42. Tapered ring 42 has interior wall 44 and edges 46 and 48. Tapered ring 42 has cooperative characteristics to snugly fit onto cone 26.

1 As seen in figure 4, display panel assembly 60 comprises frame 64.
2 Frame 64 has through-hole 66 to provide for means to removably secure to
3 base 52. Such means may be a screw that trespasses through-hole 66 and
4 attaches to base 52 for example. Display panel assembly 60 also has
5 display panel 62 and buttons 68.

6
7 Referring to figure 5, embedded within the sensor-coupling unit 20 is
8 a thermocouple sensor 21 in the preferred embodiment. Thermocouple
9 sensor 21 responds to temperature changes within the sensor-coupling unit
10 20. The thermocouple sensor 21 generates a thermoelectric voltage in the
11 temperature gradient that exists between a hot (junction exposed to the
12 temperature being measured) and cold junctions. A cold-junction
13 compensator 23 is used to develop a compensation signal, which
14 automatically varies with the cold junction temperature in such a way to
15 maintain the output signal constant for a constant temperature
16 measurement.

17
18 Analog-to-digital device 25 receives the linear voltage over the range
19 of interest and processes the signal to the microprocessor 27 to translate
20 and display as the actual temperature reading on the display panel 62,
21 which in the preferred embodiment is a liquid crystal display (LCD).

22
23 Also embedded within the sensor-coupling unit 20 is a conductivity
24 sensor 31 for detecting the presence of water within the sensor-coupling
25 unit 20. The conductivity sensor 31 consists of metal measuring
26 electrode(s), not seen, that monitor the presence of water by one of two
27 basic methods. One measures conductivity by a fixed voltage between
28 electrodes so that the resulting current flow is directly proportional to the

1 conductivity. On the other hand, the electrodes can be supplied with a
2 current flow so that the potential between the electrodes are directly
3 proportional to the resistance of the water, which is the reciprocal of its
4 conductivity.

5
6 A main operation of microprocessor 27 is to monitor signals from the
7 thermocouple sensor 21 and conductivity sensor 31 simultaneously, in
8 order to detect actual water temperature as it discharges. When water flow
9 ceases to discharge out the showerhead 86, seen in figure 6, it also ceases to
10 be present at sensor-coupling unit 20. Therefore, by monitoring the
11 conductivity inside the sensor-coupling unit 20, instant invention 10 can
12 detect when water is no longer present at the showerhead 86.

13 Microprocessor 27 commands will then halt the displaying of temperature
14 and redirect its instructions to display a text message indicating that water
15 is no longer present. Microprocessor 27 defining part of the
16 microprocessor-based circuitry seen in figure 5, has a programmable
17 memory storage system, not seen, used for retrieving multi-user
18 temperature settings.

19
20 An additional essential feature of instant invention 10 allows users to
21 save desired shower temperature settings into memory and recall them
22 later in time with push buttons 68. The instant invention 10 can save user
23 temperatures along with unique user identification with the programmable
24 memory storage system, within microprocessor 27, for future association
25 purposes. When a user turns on hot and cold water, an indeterminate
26 amount of time elapses until the desired water temperature arrives at the
27 showerhead 86. This waiting period can be exacerbated if extreme cold or
28 hot ambient temperatures exist in relation to the desired temperature. The

1 present invention 10 alerts users when the shower temperature has reached
2 their desired setting by producing an audible tone with buzzer 39 that can
3 be silenced by the user entering the shower. As a safety feature, a warning
4 tone alerts a user to potential scorching if the temperature has passed a
5 preprogrammed temperature setting. This allows a user to correct the
6 temperature safely before entering the shower. It is noted that the instant
7 invention is powered by a battery power source such as an electric battery,
8 which is not seen in figure 5 for simplicity. The electric battery may be an
9 electric dry cell battery.

10
11 Referring to figure 6 for installation, shower assembly 80 comprises
12 wall 82. Protruding from wall 82 is shower arm 84, and removably secured
13 onto shower arm 84 is showerhead 86. Sensor-coupling unit 20 is
14 detachable from panel support bracket 40 to allow installation simplicity.
15 Sensor-coupling unit 20 attaches directly onto existing standard shower
16 arm 84 by first removing the existing showerhead 86. After existing
17 showerhead 86 is removed and placed aside, ring 42 from panel support
18 bracket 40 is slipped along shower arm 84. While the panel support bracket
19 40 hangs on the shower arm 84, the female end, at edge 28, of the sensor
20 coupling unit 20 is attached to the shower arm 84 by rotating clockwise
21 until it tightens. The panel support bracket 40 is then slid down the shower
22 arm 84 until it snugly mounts upon the sensor-coupling unit 20. Finally,
23 display panel assembly 60 is ready for attaching to the panel support
24 bracket 40.

25
26 Sensor-coupling unit 20, panel support bracket 40, and display panel
27 assembly 60 can be maintained joined and installed in a single step;
28 although, separating the units proves to be more comfortable for

1 installation purposes. Once all the units are assembled, the terminating
2 connector 38, better seen in figure 2, from the connecting cable 36 can be
3 plugged into the port, not seen, of display panel assembly 60. At this time
4 the instant invention 10 can be switched on. Users have the ability to tilt
5 and swivel the display panel 62 at any time to the desired viewing angle.
6 The present invention's uniqueness is its straightforwardness installation
7 process.

8
9 The foregoing description conveys the best understanding of the
10 objectives and advantages of the present invention. Different embodiments
11 may be made of the inventive concept of this invention. It is to be
12 understood that all matter disclosed herein is to be interpreted merely as
13 illustrative, and not in a limiting sense.